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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,315	04/28/2004	Frederick W. Kern Jr.	21806-00154-US1	3314
42221 7590 05/15/2007 CONNOLLY BOVE LODGE & HUTZ LLP (IBM MICROELECTRONICS DIVISION) P O BOX 2207 WILMINGTON, DE 19899-2207			EXAMINER MOTSINGER, SEAN T	
			ART UNIT 2624	PAPER NUMBER
			MAIL DATE 05/15/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/709,315

Applicant(s)

KERN ET AL.

Examiner

Sean Motsinger

Art Unit

2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 4/28/2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>4/28/2004, 5/6/2004</u> . | 6) <input type="checkbox"/> Other: _____ |

Rejections Under 35 U.S.C. 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1-7, 9, and 11-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Shiomi et al US 2002/0159626.
2. Re claim 1 Shiomi discloses a method for controlling a process (polishing paragraph 9) acting on a moving object (wafer paragraph 70), the method comprising: providing a plurality of reference images (polishing experiments paragraph 53 note the experiments provide test images which are used to find entropy) of a feature of a reference object (test wafers paragraph 53), the plurality of reference images representing a range of process results (note there are multiple test wafers and multiple experiments this would provide a range of values) corresponding to a first sample time (note they are periodically imaged see abstract); obtaining, while the process is acting on the moving object (note the wafer is moving paragraph 70), a first image (see abstract) of a feature of the moving object (substrate surface see abstract) at a time corresponding to the first sample time (not the wafer is image periodically there must be a first sample time see abstract); and comparing the first image to one or more of the plurality of reference images (note

the images are compared via entropy) and determining, based upon the comparison result (thresholding), a necessary process adjustment (polished state is achieved i.e. stop polishing paragraph 51) of one or more process parameters of the process acting on the moving object (see title note the end point is a process parameter).

3. Re claim 2 Shiomi discloses wherein said obtaining the first image includes using a photo-stroboscopic technique (paragraph 70)
4. Re claim 3 Shiomi discloses wherein said plurality of reference (experiments with test wafers paragraph 53) images includes images representing each of a below nominal and an above nominal process result pertaining to the feature (note any variation in the experiments will provide images above and below the average (nominal) process result).
5. Re claim 4 Shiomi further discloses, after said comparing and determining, providing an essentially real-time adjustment (end point determining see abstract note the endpoint must be determined in real time) of said one or more process parameters (endpoint see abstract) of the process (polishing see abstract) acting on the moving object (paragraph 70 note the object is moving).

6. Re claim 5 Shiomi further discloses, after said comparing and determining, stopping the process acting on the moving object (note the processes is stopped at the end point see abstract)
7. Re claim 6 Shiomi further discloses, wherein said comparing includes determining periodic changes to the feature while the process is acting on the moving object. (note the entropy is calculated for each period paragraph 51 this determines the change in entropy.)
8. Re claim 7 Shiomi further discloses wherein said process acting on the moving object includes a CMP process (paragraph 34) operating on a substrate (wafer see abstract).
9. Re claim 9 Shiomi discloses a system for real-time process control of a manufacturing process operating on a moving object, the system comprising: an image capturing device (camera 30 paragraph 29); a light source (paragraph 29); a memory device (storage device paragraph 29) storing a plurality of reference images (image data paragraph 29) corresponding to at least two process conditions (entropy H1 and H2 paragraph 51) at associated sample times (see figure 5 note these are calculated at associated sample times); and a processor operatively (computer paragraph 29 note a computer has a processor) connected to the image capturing device (note the computer is connected to the camera see figure 1), the light source

(paragraph 70), and the memory device (paragraph 29), wherein the processor strobes the light source and actuates the image capturing device (note the computer controls the overall apparatus paragraph 29) to capture an image of a feature of the moving object (paragraph 70 object is rotating) at a periodicity corresponding to a movement of the moving object (synchronous with wafer rotation paragraph 70), wherein the processor compares the captured image to one or more of the stored plurality of reference images in the memory device (paragraph 52), and wherein the processor controls (finds the endpoint i.e. stops polishing see abstract) the manufacturing process operating on the moving object based upon changes to the feature during the manufacturing process (entropy H1 or H2 paragraph 52).

10. Re claim 11 Shiomi discloses wherein the processor stops the manufacturing process (determines endpoint see abstract) operating on the moving object based upon the comparison of the captured image to the one or more of the stored plurality of images in the memory device (the end point is determined by comparing image entropy see paragraph 52)

11. Re claim 12 Shiomi discloses wherein said process acting on the moving object includes a CMP process (paragraph 34) operating on a substrate (wafer see abstract).

Rejections Under 35 U.S.C. 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 8 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Shiomi in view of Babinski "Spray Develop End-Point-Detection System" IBM

Technical Disclosure Vol 33 No1A June 1990.

13. Re claim 8 Shiomi discloses all of the elements of claim 1, Shiomi does not disclose wherein said process acting on the moving object includes coating a semiconductor wafer with a resist. Babinski discloses finding the endpoint of photo-resist application (see page 1 paragraph 1) The motivation to combine is to modify shiomi to also detect the endpoint of finding a photo resist (see page 1 paragraph 1). Therefore it would have been obvious at the time of the inventions to combine Shiomi with Babinski to reach the aforementioned advantage.

14. Re claim 13 Shiomi discloses all of the elements of claim 1, Shiomi does not disclose wherein the manufacturing process controlled by the processor comprises coating a wafer with a resist. Babinski discloses finding the endpoint of photo-resist application (see page 1 paragraph 1) The motivation to combine is to modify shiomi

to also detect the endpoint of finding a photo resist (see page 1 paragraph 1).

Therefore it would have been obvious at the time of the inventions to combine Shiomi with Babinski to reach the aforementioned advantage.

15. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Casey et al. "Video Sampling and Storage Device" IBM Technical Disclosure Volume 11 No. 2 July 1968.

16. Re claim 10 Shiomi discloses all of the elements of claim 9 and picks up an image (paragraph 70) at intervals corresponding to a period of the periodic movement of the object (in synchronous with wafer rotation paragraph 70) Shiomi does not disclose a display device controlled by the processor and configured to receive an image from either the image capturing device or the memory device or both. Casey discloses a display device (monitor 20 see figure) controlled by the processor (note the monitor is controlled by the processor as it displays images supplied by it) and configured to receive an image (direct viewing page 2 paragraph 1) from the image capturing device (camera 5 see figure). The motivation to combine is to allow "direct viewing" on the monitor page 2 paragraph 1. Therefore it would have been obvious to combine Shiomi with Casey to reach the aforementioned advantage.

17. Claims 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sandu et al US 5,196,353.
18. Re claim 14 Shiomi discloses A manufacturing tool, comprising: a device which performs a process (polishing apparatus paragraph 29) on an object of manufacture (wafer see abstract) so as to cause a periodic movement (see abstract) of the object during the process; a photo-stroboscopic camera (paragraph 70) which captures an image of a feature of the object during the process; a memory device (storage device paragraph 29) storing a plurality of reference images (image data paragraph 29) corresponding to at least two process conditions (entropy H1 and H2 paragraph 51) at associated sample times (see figure 5 note these are calculated at associated sample times); and a processor (computer paragraph 29) coupled to the photo-stroboscopic camera and the memory device (figure 1 note they are connected), wherein the processor actuates the photo-stroboscopic camera (pick up an image paragraph 70) at intervals corresponding to a period of the periodic movement of the object (in synchronous with wafer rotation paragraph 70) so as to provide a series of constant orientation images of the feature, wherein the processor determines changes to the feature (substrate surface see abstract) during the process based upon a comparison between one or more of the series of constant orientation images and at least one of the stored plurality of reference images (note the images are compared to the reference images based on entropy paragraph 51), and wherein the processor communicates with the device based upon the comparison

(determines the end point see abstract) and commands an adjustment of the process performed by the device on the object of manufacture (note the process is adjusted by stopping it see abstract).

19. Shiomi does not explicitly disclose a controller operatively coupled to the device. However Sandhu discloses a controller operatively coupled to the device (automated circuitry column 6 line 37). The motivation to combine is to "automatically control the operational parameters of the CMP process." Therefore it would have been obvious to one of ordinary skill in the art to combine Shiomi with Sandu to reach the aforementioned advantage.
20. Re claim 15 Shiomi further discloses wherein the device is a polishing tool (paragraph 29) and the process is a CMP process (paragraph 34).
21. Re claim 16 Shiomi further discloses wherein the processor commands an adjustment of a CMP process (determines the end point see abstract).
22. Re claim 17 Shiomi further discloses wherein the plurality of reference images are stored in the memory device in a database structure (note the memory device see paragraph 29 can be considered a database and therefore whatever structure it is in is a database structure.)

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sean Motsinger whose telephone number is 571-270-1237. The examiner can normally be reached on 9-5 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on (571)272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


Motsinger
5/10/2007


SAMIR AHMED
PRIMARY EXAMINER